Notes on the butterflies of Bruxner Park on the north coast of New South Wales, Australia

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Abstract
The NSW north coast has a rich butterfly fauna, reflecting its location in the overlap zone between Torresian and Bassian fauna assemblages. This short paper documents observations on the butterflies of Bruxner Park, a small conservation reserve near Coffs Harbour on the NSW north coast, recording 31 species from five families and describing a butterfly hill-topping site at Korora Lookout in the south-east of the reserve. (*The Victorian Naturalist* **128**(1) 2011, 11-17).

Keywords: butterflies, Torresian-Bassian overlap, rainforest, hill-topping

Introduction

Although not particularly rich by global standards, Australia does have an interesting butterfly (Lepidoptera) fauna with a significant number of endemic species. The majority of Australian butterfly species occurs in the tropics, particularly north Queensland (Fisher 1999). The north coast of New South Wales (NSW) also has a notably high diversity of butterfly species, due to its location in the overlap zone between Torresian (northern) and Bassian (south-eastern) fauna assemblages (Braby 2004). This short paper documents observations of the butterfly fauna of a small conservation reserve on the NSW north coast to help promote an appreciation of the region's rich butterfly fauna and to document a site used for hill-topping (i.e. congregation for mating) by a suite of butterfly species.

Study Area and Methods

Bruxner Park Flora Reserve (30°15'S, 153°06'E) is a 407 ha conservation reserve near Coffs Harbour, in *Gumbaynggirr* Aboriginal Country in the NSW north coast bioregion. The reserve has a steep to undulating terrain and an underlying geology of metamorphosed shale. The vegetation is dominated by subtropical rainforest and moist eucalypt forest. Small areas of dry eucalypt forest with a grassy understorey (totalling about 10 ha) occur on north-facing upper slopes and ridge tops in the south-east of the reserve, overlooking the coastal plain.

Observations of butterflies were noted on a total of 40 days (nine days in spring, seven in summer, 20 in autumn and four in winter) over the period March 2002 to February 2003 and January 2004 to January 2005. Many of the observations were made incidentally during the course of a field survey of the vertebrate fauna of Bruxner Park (Murphy and Murphy in press) but also included nine days in March–April 2002, one day in September 2002, nine days in January–May 2004 and two days in October 2004 when butterflies were a primary target for observation. Adult butterflies were observed by day while walking along road edges, vehicle trails and walking trails. The full range of vegetation communities present was investigated, with particular attention paid to ridge top areas potentially frequented by hill-topping butterflies.

Results and Discussion

Two hundred and one records of butterflies were documented in Bruxner Park comprising 29 species from five families. A list of the species recorded is provided in Table 1, together with information on number of records, seasonal patterns and vegetation communities used. The most commonly recorded species were the Blue Triangle, No-Brand Grass Yellow and Glasswing (see Table 1 for scientific names).

Approximately 130 species of butterfly have broad scale distribution maps that include the Coffs Harbour area (Braby 2000). While some of these may not have suitable habitat available in the local area, and others rely on habitats such as mangrove, swamp forest and coastal

Table 1. Butterflies of Bruxner Park Flora Reserve. Records = number of times species noted, not number of individuals seen. Vegetation community: D = dry eucalypt forest, M = Moist eucalypt forest, R =rainforest. KL = recorded at Korora Lookout: records shown in bold are known hill-topping species (Braby 2000; Britton and Ginn 2008).

Family	Species	Records	Season	Veg. community	KL
Hesperiidae - Skippers	Regent Skipper *Euschemon rafflesia*	1	summer	M	
	Bronze Flat *Netrocoryne repanda*	1	summer	D	**X**
	Ornate Ochre *Trapezites genevieveae*	(Braby 2000)	-	-	
	Southern Silver Ochre *Trapezites praxedes*	(Sibatani 1970)	summer and autumn	R	
	Grass-dart sp. *Ocybadistes* sp./*Suniana* sp	5	autumn	M	
Papilionidae - Swallowtails	Fourbar Swordtail *Protographium leosthenes*	2	summer	DM	**X**
	Macleay's Swallowtail *Graphium macleayanus*	10	autumn and spring	DMR	**X**
	Blue Triangle *Graphium sarpedon*	19	summer, autumn and spring	DMR	**X**
	Orchard Swallowtail *Papilio aegeus*	6	summer, autumn and spring	DMR	X
	Dainty Swallowtail *Papilio anactus*	4	summer and autumn	D	**X**
	Chequered Swallowtail *Papilio demoleus*	2	spring	D	X
Pieridae – Whites & Yellows	Lemon Migrant *Catopsilia pomona*	5	summer	DM	X
	No-Brand Grass Yellow *Eurema brigitta*	21	all seasons with peak in autumn	D	X
	Large Grass Yellow *Eurema hecabe*	10	autumn	D	**X**
	Black Jezebel *Delias nigrina*	13	all seasons	DMR	**X**
	Yellow Albatross *Appias paulina*	1	autumn	M	
	Pearl-white sp. *Elodina* sp.	2	autumn and spring	DM	X
Nymphalidae - Nymphs	Evening Brown *Melanitis leda*	3	autumn and winter	DMR	
	Brown Ringlet *Hypocysta metirius*	12	autumn and spring	MR	
	Varied Sword-grass Brown *Tisiphone abeona morrisi*	1	autumn	D	**X**
	Wonder Brown *Heteronympha mirifica*	5	autumn	MR	
	Common Brown *Heteronympha merope*	1	autumn	M	**X**
	Tailed Emperor *Polyura sempronius*	3	summer and autumn	DM	**X**
	Glasswing *Acraea andromacha*	22	summer, autumn and spring	D	**X**
	Meadow Argus *Junonia villida*	11	autumn and winter	D	X
	Australian Painted Lady *Vanessa kershawi*	5	summer, autumn and spring	DM	X
	Yellow Admiral *Vanessa itea*	1	autumn	D	
	Monarch *Danaus plexippus*	12	summer, autumn and spring	DM	X
	Blue Tiger *Tirumala hamata*	10	summer, autumn and spring	DMR	X
Lycaenidae - Blues	Hairy Line-blue *Erysichton lineata*	3	summer and autumn	DM	X
	Common Grass-blue *Zizina labradus*	10	summer and autumn	D	X

heath not present in Bruxner Park, it is likely that more butterfly species would be identified in Bruxner Park by further survey effort. Several additional species were seen but not identified in the present study and it is probable that the skippers (Hesperiidae) and blues (Lycaenidae) in particular are under-represented in the list of species provided. Records of two additional skipper species, the Southern Silver Ochre *Trapezites praxedes* and Ornate Ochre *Trapezites genevieveae*, from Bruxner Park were noted by Sibatani (1970) and Braby (2000) respectively

and have been included in Table 1. The Australian Museum has specimen records of 25 butterfly species from the Coffs Harbour area (D. Britton, Australian Museum pers. comm. November 2010), including 12 species additional to the present study, with suitable potential habitat available in Bruxner Park, such as the Eastern Dusk-flat *Chaetocneme beata* and Splendid Ochre *Trapezites symmomus* (Hesperiidae), Common Pencil-blue *Candalides absimilis* (Lycaenidae) and Danaid Eggfly *Hypolimnas misippus* (Nymphalidae). Twenty-one species observed during the present study are additional to the Australian Museum records for the Coffs Harbour area.

The documented butterfly fauna of Bruxner Park comprises a mix of Torresian and Bassian species, typical of the NSW north coast. Species with a Torresian distribution include the Regent Skipper, Fourbar Swordtail, Large Grass Yellow, Glasswing and Blue Tiger. Bassian species include the Varied Sword-grass Brown, Wonder Brown, Common Brown and Yellow Admiral. The national status of the species identified was assessed as 'common to very common and widespread' by Braby (2004) except for eight species (Regent Skipper, Bronze Flat, Fourbar Swordtail, Black Jezebel, Varied Sword-grass Brown, Wonder Brown, Monarch and Hairy Line-Blue) listed as 'common but local', one species (Tailed Emperor) listed as 'uncommon but widespread' and two species (Southern Silver Ochre and Ornate Ochre) listed as 'uncommon to rare and local'.

Some of the interesting butterflies found in Bruxner Park are illustrated. Information on general biology is from Braby (2000). The Bronze Flat (Fig. 1), an Australian endemic, is generally active only in the morning and males establish hill-top territories while perching on shrubs close to the ground. It was recorded only once in Bruxner Park, when it was found to be common on a hill-top in dry open forest on a sunny summer morning. The Black Jezebel (Fig. 2) is another Australian endemic. The larvae feed on a variety of mistletoes and adults are typically active high in the canopy, retreating to the shade when it is hot. They were frequently seen flying amongst the treetops in moist and dry eucalypt forest at Bruxner Park, and the animal pictured was found resting within two metres of the ground in rainforest. The Evening Brown (Fig. 3) occurs from Africa, India and south-east Asia to northern Australia and the

Fig. 1. Bronze Flat *Netrocoryne repanda*.

Fig. 2. Black Jezebel *Delias nigrina*.

Fig. 3. Evening Brown *Melanitis leda*.

west Pacific. It is active at dawn and dusk, and during the day was found resting quietly on the ground in rainforest, where its cryptic colouration blended in with the leaf litter. The Brown Ringlet (Fig. 4), endemic to eastern Australia, was typically seen basking with wings open in sunlit patches of long grass on roadsides in tall open forest and rainforest. The Wonder Brown (Fig. 5), endemic to coastal south-eastern Australia, is restricted to rainforest and adjacent tall open forest. The dark-coloured females (pictured) tend to remain in shady gullies while the paler males move into more sunlit open areas. The Common Brown (Fig. 6) is endemic to south-eastern and south-western Australia. It was recorded only once in Bruxner Park, when the female pictured was found sunning on the ground on a hill-top on an autumn morning. The Tailed Emperor (back cover) is a large, fast-flying butterfly with the lower wing surfaces intricately patterned. It is found in the Torres Strait islands, northern and eastern Australia and Lord Howe Island. It was recorded several times at Bruxner Park at the one hill-top site, flying back and forth and perching high in the canopy. The Glasswing (Fig. 7), named for the transparent forewings, occurs in Indonesia,

Fig. 4. Brown Ringlet *Hypocysta metirius.*

New Guinea, northern Australia and the west Pacific. It has a slow fluttery flight close to the ground and was regularly observed in hill-top grassy dry forest at Bruxner Park. The Blue Tiger (front cover) ranges from south-east Asia and New Guinea to northern Australia and the west Pacific. It breeds in vine thickets and littoral rainforest in northern Australia and regularly migrates further south. It was usually scarce in Bruxner Park with occasional irruptions of high numbers in summer.

Relatively few species (8 out of 29) were recorded in rainforest in Bruxner Park. The closed canopy of the rainforest was inaccessible and opportunities for observation were restricted to the shaded ground layer and to road edges. A few species such as the Evening Brown and Wonder Brown were seen in the shaded rainforest interior and additional species including the Macleay's Swallowtail, Blue Triangle, Brown Ringlet and Blue Tiger were occasionally seen on sun-lit roadsides, particularly areas with Lantana *Lantana camara.* It is likely that the upper surface of the rainforest canopy supports a rich butterfly fauna.

Ridge tops in Bruxner Park were targeted for butterfly observations in this study, and a total of 25 species (86% of the total) was recorded there. The open canopy of the ridge top eucalypt forest facilitated observation of butterflies moving through the canopy as well as providing natural sunlit patches at ground level which were utilised by butterflies. High points in the landscape may also be used by butterflies congregating for mating (Baughman and Murphy 1988; Guy *et al.* 2004; Murphy 2008) and observations during this study indicated that some of the ridge tops in Bruxner Park were used as hill-topping sites. The most notable butterfly hill-topping site recorded was at Korora Lookout (30°15'53"S, 153°06'59"E), in the south-east of Bruxner Park. Korora Lookout (280 m AHD) is a prominent localised easterly thrusting of the sub-coastal escarpment, standing about 250 m above the adjacent narrow coastal plain, and has dry eucalypt forest with a grassy understorey on the north-facing slope and moist eucalypt forest with an understorey of shrubs on the south-facing slope. Twenty two butterfly species were recorded there (Table 1), of which 50% (11 species) are known hill-topping species (Braby 2000; Britton and Ginn 2008). The maximum number of butterfly species recorded at Korora Lookout at one time was 13 species (in April 2004). Hill-topping behav-

Fig. 5. Wonder Brown *Heteronympha mirifica.*

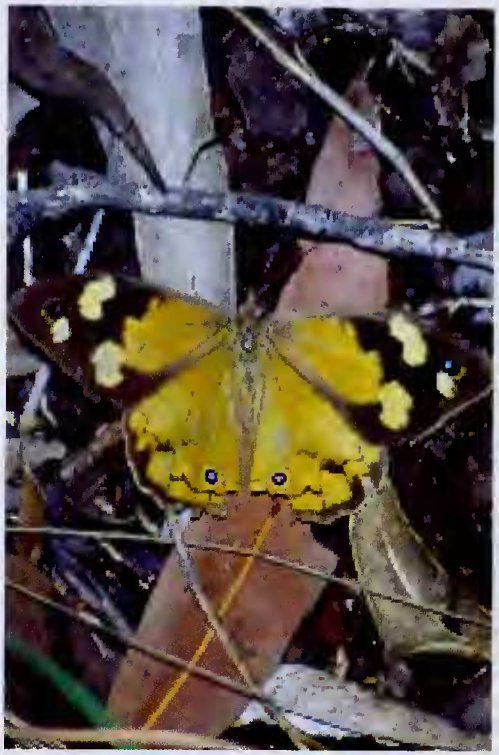

Fig. 6. Common Brown *Heteronympha merope.*

Fig. 7. Glasswing *Acraea andromacha.*

iour (including congregating, patrolling and chasing) by a number of species including the Bronze Flat, Fourbar Swordtail, Blue Triangle, Black Jezebel, Tailed Emperor and Glasswing was observed there. The total number of species and number of hill-topping species recorded at Korora Lookout is within the range of that documented at other butterfly hill-topping sites between Sydney and the NSW/Queensland border (Newland 1997; Dunn 2006; Hawkeswood 2007; Britton and Ginn 2008).

For a survey of the temperate butterfly fauna of north-western Sydney, Britton and Ginn (2008) estimated that three to four visits could suffice for an experienced lepidopterist to identify over 90% of the butterfly species occurring at a given hill-top site. They further recommended that survey timing include both January-March and October to capture seasonal variation. The cumulative curve for species recorded at Korora Lookout during 8 visits over the period January-April and October 2004 (with butterflies a primary target for observation) shows that only 59% of total species known for the site had been identified by the fourth visit and that 90% was only reached at the seventh visit (Fig. 8). The two additional species only recorded outside this period were the Common Brown (in March 2002) and Varied Sword-grass Brown (in May 2004). The slower detection rate at Korora Lookout may reflect the relative inexperience of this author (a general zoologist rather than butterfly specialist) or could be related to this particular site. As noted above, skippers (Hesperiidae) and blues (Lycaenidae) were poorly sampled in the present study, and it is likely that further survey including targeting of these groups would identify additional hill-topping species at Korora Lookout.

Bruxner Park Flora Reserve is significant as one of the few surviving lowland rainforest sites on the NSW north coast (Date *et al.* 1991) and supports a very rich land snail fauna (Murphy 2007) and vertebrate fauna (Murphy and

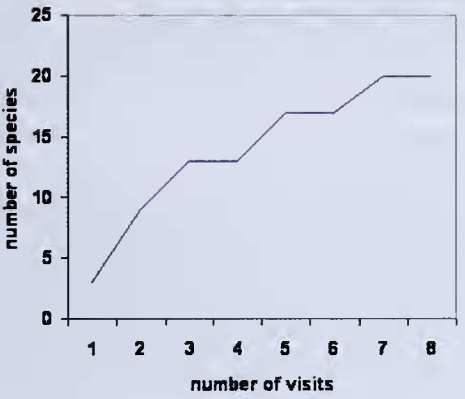

Fig. 8. Cumulative species curve for detection of butterfly species at Korora Lookout, Bruxner Park Flora Reserve, over the period January-April (6 visits) and October (2 visits) 2004.

Murphy in press). The present paper highlights the diverse butterfly fauna of the reserve, typical of the NSW north coast. Degradation and loss of hill-topping sites is a significant threat to butterflies (NSW Scientific Committee 2001; Sands and New 2002; Hawkeswood 2007) and the butterfly hill-topping site at Korora Lookout reported here is an addition to the documented conservation values of this small reserve.

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References

Baughman JF and Murphy DD (1988) What constitutes a hill to a hilltopping butterfly? *American Midland Naturalist* **120**(2), 441-443.

Braby MF (2000) *Butterflies of Australia: their Identification, Biology and Distribution.* (CSIRO Publishing: Collingwood Victoria)

Braby MF (2004) *The Complete Field Guide to Butterflies of Australia.* (CSIRO Publishing: Collingwood Victoria)

Britton DR and Ginn SG (2008) Hill-topping butterflies of the Hawkesbury-Nepean CMA: Hill-tops in the Estuary subcatchment. Unpublished report for the NSW Department of Environment and Climate Change.

Date EM, Ford HA and Recher HF (1991) Frugivorous pigeons, stepping stones, and weeds in northern New South Wales. In *Nature Conservation 2: The Role of Corridors*, pp. 241-45. Ed DA Saunders and RJ Hobbs. (Surrey Beatty: Sydney NSW)

Dunn KL (2006) Butterfly checklists for five national parks in eastern Australia: compiled unpublished reports sent to state conservation services during the 1990s. *Calodema* **6**, 10-27.

Fisher R (1999) *A Field Guide to Australian Butterflies.* (Surrey Beatty: Chipping Norton NSW)

Guy P, Saltz D, Thulke HH and Motro U (2004) Response to topography in a hilltopping butterfly and implications for modelling non-random dispersal. *Animal Behaviour* **68**(4), 825-839.

Hawkeswood TJ (2007) The conservation and ecological importance of a hill-topping site at East Killara, New South Wales, Australia. *Giornale Italiano di Entomologia* **12**, 31-45.

Murphy MJ (2007) The diverse land snail community of Bruxner Park on the north coast of New South Wales, Australia. *The Victorian Naturalist* **124**(5), 306-309.

Murphy MJ and Murphy SP (in press) A nine year survey of the vertebrate fauna of the Bruxner-Ulidarra conservation area in the New South Wales north coast bioregion. *Australian Zoologist.*

Murphy SM (2008) Notes on *Papilio machaon aliaska* (Papilionidae) populations near Fairbanks AK. *Journal of the Lepidopterists' Society* **62**(2), 80-83.

NSW Scientific Committee (2001) Final recommendation to list loss and/or degradation of sites used for hill-topping by butterflies as a key threatening process under the NSW *Threatened Species Conservation Act* 1995. Notice published in the Government Gazette of the state of New South Wales 20 April 2001.

Newland G (1997) Butterfly species richness at four hilltops in northern coastal New South Wales. *Victorian Entomologist* **27**(4), 72-78.

Sands DPA & New TR (2002) *The Action Plan for Australian Butterflies.* (Environment Australia: Canberra)

Sibatani A (1970) An aberrant form of *Trapezites maheta praxedes* (Plotz) (Lepidoptera: Hesperiidae) from New South Wales. *Australian Journal of Entomology* **9**, 67-68.

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